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THE CONFERENCE PAPERS.

No. 3. The Adult Tapeworms of Sheep, particularly those occurring in Great Britain.

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The adult tapeworms occurring in sheep belong to the cyclophyllidean family Anoplocephalidæ, Kholodkowsky, 1902. In a recent monograph of the Anoplocephalidæ, Douthitt (1915), gives the following family diagnosis:—"Scolex and suckers unarmed. Segments nearly always broader than long, generally many times broader than long. Genital pores marginal except in *Aporina*. Testes numerous except in *Triplotaenia*. Uterus transverse. Embryos with thin transparent shells usually with a pyriform apparatus borne upon the innermost shell. Adults in mammals and birds, mostly in herbivorous mammals. Larval stages unknown." The family Anoplocephalidæ is divisible into four sub-families of which only three, Anoplocephalinæ, R. Blanch., 1891, Thysanosominæ, Fuhrm., 1907, Avitellininæ, Gough, 1911, need concern us here. The first sub-family Anoplocephalinæ includes six species occurring in sheep, all belonging to the genus *Moniezia*, viz., *M. expansa*, Rud., 1810, *M. trigonophora*, Stiles and Hassall, 1892, *M. planissima*, Stiles and Hassall, 1892, *M. benedeni*, Mon., 1879, *M. neumanni*, Moniez, 1891, and *M. alba*, Perron., 1874. The second sub-family includes only the two species *Thysanosoma actinioides*, Dies., 1835, and *Th. giardi*, Mon., 1879, whilst in the third sub-family are found *Avitellina centripunctata*, Riv., 1874, *Stilesia hepatica*, Wolffhuegel, 1903, and *St. globipunctata*, Riv., 1874.* Of the three genera *Moniezia* occurs most commonly in sheep, and *Moniezia expansa* would appear to be by far the commonest sheep tapeworm. Three other species are on record from sheep, viz., *Moniezia denticulata*, Rud., 1804, *Moniezia nullicollis*, Moniez, 1891, and *Taenia vogti*, Moniez, 1879, but it is extremely doubtful whether any of these can be considered a valid species.

* Three other species occurring in sheep in the Ukraine were inadvertently omitted from the list given above. They are *Moniezia pallucida*, Blei, 1921; *Avitellina laciniosa*, Blei, 1921; and *Hexastichorchis Pintneri*, Blei, 1921.

The following is a brief characterisation of the genus *Moniezia* adapted from Stiles and Hassall, 1893:—

Moniezia—R. Blanch., 1891. Anoplocephalinæ. Segments generally broader than long and longer than thick, but showing a tendency to become longer and narrower posteriorly. Genital organs, genital pores and uteri double in each segment. Vagina crosses the cirrus pouch dorsally on the left and ventrally on the right side. Genital canals, dorsal to longtitudinal excretory vessels and nerves. Interproglottiddeal glands usually present. Eggs with well developed pyriform body. Type species *M. expansa*.

The members of this species are parasitic in mammals and birds, and are widely distributed throughout the world. *Moniezia expansa* occurs throughout Europe, North and South America, Africa and India, and Australia. This species has been recorded in England by Hassall. It was the tapeworm most commonly found by Flattely (1922) in lambs in Wales and Aberdeen, and by myself in North Wales and the Kent marshes. As regards the occurrence of other *Moniezia* in England, Flattely (1922) has recently recorded the presence of *M. trigonophora* in Wales. The same worker records the finding of a single specimen of *M. alba* in a lamb reared in Anglesey, while Pillers (1923) reports the occurrence in the West Riding of Yorkshire of *M. neumanni*, determined by Southwell, and Cameron (1923) the finding of *M. expansa* and *M. planissima* in Scotland. It is probable that a systematic survey of the tapeworms of sheep in Great Britain would bring to light the occurrence of other species.

Of the other three genera no members are so far recorded in England, but certain peculiarities in their distribution are worthy of remark.

The genus *Thysanosoma*, Dies., 1834, includes two species occurring in sheep, the first, *Thysanosoma actinioides*, the common fringed tapeworm of sheep in America, and the other *Th. giardi* occurring in France, Italy, Germany, America, and Africa.

Avitellina, Gough, 1911, was erected for the single species *A. centripuncta*, which has been recorded from Italy, Africa, and India, whilst *Stilesia* includes two species parasitic in sheep, *S. globipunctata*, Riv., 1874, occurring in France, Italy, and India, and *S. hepatica*, Wolff., 1903, in Africa and India.

DISTRIBUTION.

It may be safely stated that *Moniezia* occurs wherever sheep are farmed at all intensively in this

country. So far it does not appear to have been observed actually on hill farms or mountain sheep walks, but I have collected specimens from the Hampshire downs. It is most prevalent in marshy pastures, such as the Kent marshes, portions of Suffolk, the Lincoln and Cambridge fens, and the rich bottom pastures at the foot of the Welsh Hills. Throughout Europe it is known to exist on similar conformations. It is reputed to be the cause of heavy losses on the low plains of Central Europe, in Germany and Hungary in particular. According to Spinola (1863) it frequently occurs in the Ruhr District. Flattely (1923) has recently drawn attention to its occurrence in the Roman Campagna and Sardinia. Gilruth (1901) has recorded extensive losses from this parasite in Australia and New Zealand, while McMurrich (1884) and McEachran (1888) have described outbreaks in Canada. In the United States Cooper Curtice (1889) investigated the disease in the Western States and Colorado. It was expected to find heavy infestations with *M. expansa*, but actually Curtice found the disease to be due mainly to *Thysanosoma actinioides*. Gough (1908) has reported the presence of *M. expansa* in South African sheep.

The distribution of the species of *Thysanosoma*, *Stilesia*, and *Avitellina* has already been discussed.

Tapeworm Disease.

Pathological conditions directly due to the presence of *Moniezia* species in the small intestine are, as a rule, only observed in lambs up to one year old. In England one might almost say that the disease affects lambs of a few months old only. The earliest symptoms are those of a mild, but progressive anæmia. The mucous membranes and skin are pale, the fleece brittle and poor in growth. The mucous membranes, however, never reach the extremely blanched condition so characteristic of liver rot. The animals thrive badly, finally becoming emaciated, although appetite is usually increased. Throughout the period of infestion, growth is decreased to such an extent that in a heavily infested flock the lambs may appear from one to two months younger than their actual age. Digestive disturbances and colic are more frequent in the flock than normally. Constipation alternates with short periods of diarrhœa. The abdomen is distended. If treatment is not carried out the lambs become more and more debilitated, diarrhœa is continuous and finally the animals become decumbent and die. At times convulsions are observed before death (Neumann, 1905). Cox (1855) and Cross (1877) recorded the occurrence of an outbreak in which the chief symptom was scouring. Usually the presence of tapeworm in a flock is noticed by a careful shepherd when the earliest lambs are from seven to ten weeks old. In the first place a strobila is generally observed hanging from the anus of one of the lambs. Examination of fæces will now reveal the presence of occasional proglottids. As a rule the symptoms described will only supervene if the condition is neglected for some two or three months after the initial observation and only in flocks where infestation is very heavy. Of course the degree of rapidity with which symptoms manifest themselves varies directly with the heaviness of the infestation. On many farms tapeworms are to be found each year, but treatment is not undertaken since the slight loss of condition is not considered to warrant the necessary expenditure in time and money. Occasional bad years, however, are experienced in these districts, and it is in such years that the practitioner is called upon to treat heavily infested flocks. In such districts the annual experiences of the farmers have led them to hold the view that the infestation is a harmless one, and not infrequently when the practitioner has diagnosed the condition as being due to *Moniezia* the owner and shepherd are reluctant to accept the fact, and contest the diagnosis on the basis of their former experiences. In other districts, however, more especially where the sheep are of a better class the flockmaster and shepherd have learned by experience that the presence of tapeworms in some of the lambs of the flock is to be regarded as a warning sign, and treatment of the whole flock is undertaken forthwith. The fact that infestation recurs constantly from season to season on infested farms also accounts for the readiness with which the condition is recognised by these owners and attendants. On such farms treatment of all lambs is often a routine procedure once or twice in every season, and neglect of this precautionary measure with the subsequent development of severe symptoms would be regarded as bad animal management.

Post-Mortem Appearances.

The presence in the small intestine of numerous *Moniezia* obstructing the lumen and giving rise to a sub-acute catarrhal inflammation of the mucous membrane, may be regarded as diagnostic of the disease. In the western United States where the disease is usually caused by *Th. actinioides*, these parasites are found with great frequency in the gall ducts and pancreatic ducts. *Stilesia hepatica* is found on the surface of the liver and in the bile ducts of wild ruminants and sheep in South Africa and India. In connection with the common site of election of *Th. actinioides* it may be of interest to note here that Schwartz (1921) was able to demonstrate a hæmolysin from the tissues of this species. No such hæmotoxin could be detected in the tissues of *M. expansa*. From the reports of Curtice it would appear that the disease produced by *Th. actinioides* is in general rather more severe than that due to *Moniezia*. The pathogenic effects of *Moniezia* appear to be due almost entirely to primary impairment of the digestive function of the small intestine caused by the presence of the worms in the lumen, their attachment and movements, and the consequent catarrh of the mucous membrane. From analogy with the symptoms observed in man it would appear probable that reflex irritation can play a prominent part in the production of emaciation.

Anthelmintic Treatment.

It may be broadly stated that where one is concerned with the inhibition of symptoms or the removal of symptoms already developed the problem of anthelmintic treatment is a fairly easy one. Perhaps the earliest reliable experiments in this direction are those of Schwalenberg (1869), referred to by Zurn (1882). Schwalenberg reported succesful results from the treatment of lambs with kamala, 3.75 grammes, kousso, 7.5 grammes, and koussin, 12 centigrammes. Cross (*loc. cit.*) reported good results from the use of the following drench :—

℞ ol. tereb., ℥ss.
pulv. filicis maris.
pulv. arecæ a.a. gr. xx.
ol. lini., ℥ii.

Zurn (1882) and Neumann (1905) recommend the use of Chabert's empyreumatic (turpentine, tartar emetic and oil) in doses of one teaspoonful. According to Hall (1921), kamala may be given in doses of 1 dram to lambs, kousso in 2 dram doses and koussin in 2 grain doses. Oleoresin of male fern may be used in doses of 1 dram with castor oil. Areca nut (freshly ground) may be used in doses of 1-3 drams. The usual copper sulphate (1 per cent.) treatment for stomach worms is said also to remove tapeworms. In South Africa sodium arsenate has been recommended with copper sulphate in proportions of 1 to 4, young lambs receiving 3 grains of this mixture after being fasted overnight; the dose may be repeated under similar conditions the next day. The Oklahama Experiment Station recommends the use of 1 per cent. copper sulphate solution containing also 1 per cent. powdered tobacco or snuff. Other remedies that have been advocated are picrate of potash in doses of 10-20 grams daily (Zurn, 1882), tansy root (Neumann; Neveu Lemaire), and naphthalin, 17 grains twice daily for seven days (Mojkowski). In this country the remedy of choice is usually oil of male fern in doses of about 1 dram. It is that which the writer has found most successful. It should be given after fasting overnight, and is with advantage accompanied by castor oil or linseed oil. This is an excellent annual routine treatment for lambs on infected farms.

Life History.

The life history is unknown and it is therefore not possible to formulate successful prophylactic measures. The nature of the life cycle of the Anoplocephalidæ is one of the most interesting problems in helminthology, and it has been the subject of some experiment and much speculation. Most of the literature on the subject has been reviewed by Flattely (1922). This author points out that there are two distinct view points from which suggestions as to the life history of these forms have been made, the first that the services of an intermediate host (probably an invertebrate) are required, and the second that the adult may develop directly from the eggs without the intervention of an intermediate host. The first view is orthodox and is most generally held. The second was put forward by Megnin (1883) and has since been supported by Cooper Curtice. The most weighty argument in favour of the second view is the work of Grassi and others (Grassi, 1889), who infected mice with *Hymenolepis fraterna* by feeding the ripe eggs. In Grassi's experiments the cysticercoid stage appeared in the intestinal villi in from three to four days and the adult forms in the intestine in from 15 to 30 days. Calandruccio (1906) observed the passage of eggs of *H. nana* through the gut of flies unchanged and he subsequently was able to observe the infection of a child who ingested these eggs. Grassi's experiments were confirmed by Joyeux (1920) on laboratory rats in Paris. Ransom (1906) has suggested that this parasite may reproduce by alternative cycles, in the one case developing directly and in the other employing an intermediate host. From time to time workers have reported the finding of cysts which they believed to be those of *H. nana* or *H. fraterna*. Dampf (1910) recorded the finding of such cysts in *Mesopsylla eucta* of the gerboa. Nicoll and Minchin (1910) found two types of cysticecoid in the rat flea *Ceratophyllus fasciatus*, one armed and one unarmed. They expressed the view that the second was the intermediate stage of *H. diminuta* and that the former might be that of *H. murina*. The same forms were found in Australia by Johnston (1912) who was inclined to make the same determination. The subject is still a matter of some controversy and is further complicated by differences of opinion as to the common identity or otherwise of the species occurring in man and the rat. Baylis (1922, *Parasitology*, xiv.) has suggested that it is highly probable that the armed cysticercoid found in rat fleas by Nicoll and Minchin and by Johnston is the larval stage of *H. longior* (Baylis, 1921) of the rat. It is worthy of remark that other species of the genus *Hymenolepis* have an orthodox life-cycle, although they display considerable adaptability in the matter of accommodating themselves to various intermediate hosts. The case mentioned by Flattely of auto-infection of man with cysticerci of *T. solium* is not at all comparable to the case of *H. nana* or to the possibility under consideration in connection with *Moniezia*. Cooper Curtice based his opinion that the life cycle of *Moniezia* was direct, largely on the results of experiments carried out in 1890, in which he obtained infection in some lambs kept in a stable with a small hillside run. As pointed out by Flattely, Curtice's experiments did not exclude the presence of coprophagous insects and numerous other animals which may possibly serve as the intermediate host. Zurn (*loc. cit.*) has stated that infection occurs in stabled sheep, but Flattely was informed that stable sheep in the Marches of Ancona, Romagna, Perugia, and Umbria are free from infection. The conditions of stabling, the nature of the floor, the frequency of the removal of manure and other factors, may vary to such an extent that observations of natural occurrence under such conditions are valueless unless they are accompanied by detailed and accurate information on these

points. On the question of actual feeding experiments to demonstrate the possibility of direct infection, the feeding of mature eggs by Stiles (1893) gave only negative results, as did a similar experiment by Flattely (1922). In spite of his conviction Curtice also was unable to demonstrate infection by the direct method. The early age at which well-developed *Moniezia* may be found in lambs (according to Spinola one month, Cooper Curtice two months, Flatterly four to six weeks) has led to the expression of the view, especially by shepherds and flock owners, that the lambs are born infected, or alternatively that the mother conveys infection to the lamb through the milk. In the writer's own experience two months is the earliest age at which infection has been recognised in lambs, although flock owners and shepherds frequently assert that they have observed infection at the age of one month. In his work on the Anoplocephalids of the pocket gopher which harbours a number of related species, Douthitt never found infection in gophers less than eight months old even though they were apparently fully grown. Flattely made observations on the udders and milk of ewes to determine if the presence of larval forms could be demonstrated; the results were negative. Experiments are in progress at this laboratory which may possibly throw some light on this point.

It would seem that the supporters of the direct life cycle theory have been driven to that view as a result of the failure to discover any intermediate host and on account also of the early age at which lambs acquire infection. In this connection the history of *Schistosoma* might be recalled. Looss as a result of repeated failures to demonstrate an intermediate host for the Schistosomes of man in Egypt, was in similar fashion driven to the conclusion (which he maintained until the discovery of the complete life cycle in 1914) that development was direct.

The more orthodox and generally accepted view that an intermediate stage exists in some invertebrate presents several possibilities. In view of the early stage at which infection must take place ectoparasites have frequently been regarded as possible intermediate hosts. A number of examinations of ectoparasites, and in particular of *Melophagus ovinus*, have been made by various writers [McMurrich (1884), Stiles (1893)] but always with negative results. *Melophagus ovinus* would appear to be the only ectoparasite of sheep which has as widespread a distribution as tapeworm. Douthitt (1915) has examined all the ectoparasites of a large number of pocket gophers infected with Anoplocephalid tapeworms without result. The remarkable fact, already referred to, that gophers under the age of eight months were never found to be infected with Anoplocephalids might be construed as an indication that an intermediate host with a very well-defined seasonal incidence was concerned. Douthitt observed that animals from sandy uplands were always free from infection, while those on wet, fertile lowlands in the immediate vicinity of the burrows of the uninfected animals might be heavily infected. This coincides fairly well with our knowledge of the distribution of *Moniezia* in sheep. Attempts to infect the camel cricket, which abounds in the tunnels of the pocket gopher where infection occurs, proved negative. Stiles (1893) expressed the opinion that the intermediate stage should be looked for in some insect, worm, or snail. Grassi and Rovelli (1892) and Lebour (1915) have noted that slugs will consume vast quantities of ripe proglottids of *Moniezia*. Experiments by Lebour (*loc. cit.*), however, on the feeding of eggs to slugs (*Agriolimax agristis* and *Arion circumscriptus*) gave negative results. Railliet (1916) recorded some observations in the feeding of slugs to pigeons in which he obtained an infection with *Bertiella delafondi*, but his experiment appears to have been insufficiently controlled. Flattely (1922) also reports having examined slugs (*Agriolimax agristis* and *Arion hortensis*) from pastures with negative results. The writer also has examined without result numerous slugs belonging to the last mentioned two species taken in infected cattle and sheep fæces.

The coprophagous beetles constitute another group to which attention has been given. Joyeux (1920) reported the finding of cysticercoids in the dung beetle *Geotrupes sylvaticus* eleven days after the feeding of ripe segments of *Moniezia expansa*, but of 83 beetles so fed, one only contained about 20 cysts. In a personal communication Professor Joyeux has since informed me that the cysts proved to be the larval stage of the tapeworm of a common shrew. *Geotrupes* is not as a rule found in the fæces of sheep, but it is more common in horse fæces; moreover, in this country *Geotrupes* does not appear until the summer is well advanced, while *Moniezia* occurs from early spring into summer. Joyeux also attempted to infect other dung beetles (*Onthophagus vacca*, *Aphodius fimetarius*, *Aphodius granarius*), snails of the genera *Helix* and *Succinea*, and various slugs without success. Flattely (*loc. cit.*) collected and dissected over a hundred individuals of *Aphodius* (mostly *A. punctato-sulcatus*, but also *A. prodromus*, *A. ater*, and *A. rufipes*), about sixty Staphylinids (*Aleocharis lanuginosa*) and a score of dung flies (*S. stercorarius*) without result. The same writer endeavoured to infect beetles (*Aphodius*) by feeding them on fæces liberally sprinkled with ripe proglottids. About 20 of these beetles were examined, but the experiment proved negative. In this laboratory large numbers of coprophagous beetles (upwards of three hundred) and predaceous species occurring in dung (*Aphodius prodromus*, *A. granarius*, *A. erraticus*, *A. fimetarius*, *A. rufipes*, *Onthophagus fracticornis*, *Oxyomus porcatus*, *Cercyon haemorrhoidale*, *C. melanocephalum*, and *Hister carbonarius*) taken from infected fæces have been examined. Considerable numbers of these species were fed upon fæces containing proglottids and examined at various intervals up to seven months from the commencement of feeding, but in no case was larval development observed. Beetles were kept alive in specially constructed vessels of glass and plaster of Paris for upwards of ten months in the hope that it would be possible to

examine larvæ reared and fed under these conditions, but unfortunately all died off during the winter. It seems improbable in the face of these results that the intermediate host can be a dung beetle. Earthworms have been examined by Stiles (1893) and subjected to feeding experiments without result. Flattely also has reported negative results from the examination of earthworms collected in infected areas.

The intention expressed by Flattely to examine coprophagous mites such as *Gamasus* and *Macrocheles* seems to be a sound one. These mites have occasionally been found in this laboratory during the examination of fæces taken directly from the rectum of lambs under six weeks old, so that their ingestion cannot be an infrequent occurrence.

The writer is at present conducting an observation on badly infested land with a number of lambs, some of which are muzzled, others unmuzzled, all being fed on cow's milk. The results are not yet available, but in the event of any of ten lambs now remaining under experiment becoming infected, an indication may be furnished as to the lines along which investigation should be pursued.

In conclusion, I may say that practitioners in districts where *Moniezia* occurs may be able to collect valuable information on what may be termed the epizootiology of the disease. Information as to the nature of the soil on which infection occurs, facts concerning the distribution of the parasite in counties, and its distribution in different parts of the same farm, the earliest age at which infection is noticed after lambing, are, if carefully gathered, all worthy of record and may prove of value to investigators.

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DISCUSSION.

Professor J. F. CRAIG, in opening the discussion, said: I have first of all to thank the association for the honour they have done me in asking me to open the discussion on Mr. Daubney's paper. The task which I have been set is a singularly light and pleasant one—pleasant because it entails very little adverse criticism, and light inasmuch as the facts known regarding the subject have been so well presented in the paper that very little can be added.

Mr. Daubney has given us an excellent review of our knowledge of the adult tapeworms of sheep, and he has drawn for his purpose on most of the available literature referring to species, their characters, their effects, their treatment and prevention, and to the speculations regarding their life history.

It does seem rather remarkable that although some fourteen species of these parasites are recorded as occurring in sheep, only a few of these have been identified in these islands. That is probably due to the infrequency with which the practitioner is called in to deal with outbreaks of the disease caused by these worms. The affected sheep are often treated by the shepherd himself, and the losses which are incurred are often comparatively small, possibly in part as the result of the periodic treatment. In any case the tapeworms of sheep are nothing like so serious in their effects as the nematodes of the abomasum. They often do little more than bring about some loss of condition. For my part, the species of tapeworms which I have almost constantly encoun-

tered in sheep is *Moniezia expansa*. I have only seen one specimen of *Moniezia alba*. Perhaps if these worms were given more attention several other species would be recognised.

From what I have seen and heard I agree with the statement that the tapeworms are more common on low-lying, marshy lands, *i.e.*, under the same conditions in which other worm parasites are most prevalent. Hence tapeworms and round worms are often associated, and it may be difficult at times to come to a conclusion as to which worms are causing the chief trouble. I am, however, inclined to think that it is usually only when the strongylidæ of the alimentary canal are also present in great numbers that serious losses are met with.

As regards symptoms, there can be little doubt that their gravity is dependent upon gross infection and that a few parasites seldom or never cause trouble.

Young sheep are the chief sufferers, but I have one record in which the history suggests that occasionally ewes may also be involved. In this outbreak two or three ewes died after showing symptoms of diarrhœa ; afterwards a number of lambs began to die off, and, in the latter cases, the deaths were preceded by convulsions. One of the dead lambs was examined, and it was found that a large tract of the intestines was almost completely impacted with tapeworms (*M. expansa*). There appeared to be little doubt that the death of the lambs was caused by tapeworms, and of course the suggestion was that the ewes were affected in the same way. That was, however, not definitely proved.

As regards treatment, the removal of tapeworms in sheep by anthelmintics is comparatively easy, and probably that is related to the absence of hooklets, but, unfortunately, the problem is often complicated by the fact that these worms are frequently associated with the strongyles of the abomasum, which are far more formidable parasites and much more difficult to eradicate. For myself, I favour the use of white arsenic, either alone or combined with sulphate of iron. This may be given very conveniently in the form of pill or powder, and in that way the whole flock can be very rapidly subjected to treatment.

As regards the question of prevention, I cannot agree with the statement of the essayist that it is not possible to formulate successful prophylactic measures in the absence of knowledge of the life history of the tapeworms of sheep. There are two elementary facts which we know regarding these worms on which can be based recommendations which are of value in preventing trouble. One of these facts is that the adult worms are found in the small intestines, and the other is that the eggs and adult segments are found in the fæces, and the infection is thus scattered over the land. One would, therefore, recommend the anthelmintic treatment of the affected flock after segregation, the destruction of the tapeworms and droppings passed, and the application to the land of agents, such as quicklime, which will destroy the eggs. Moreover, at the present time it is recognised that losses are largely prevented by the periodic use of anthelmintics in flocks where these tapeworms are common. Even if the life history of these tapeworms had been worked out, it is unlikely that more effective measures than those mentioned could be instituted. The speculations regarding the life cycle referred to by Mr. Daubney indicate the possibilities of the case, and if one examines these possibilities they do not appear to indicate that anything further can be done in the way of prophylaxis.

If an ectoparasite acts as an intermediate host, the only common one is the *Melophagus ovinus*. So far as observations have gone, the results have been completely negative. Moreover, according to JOYEUX in his investigations on the life history of the *Hymenolipsis diminuta*, the intermediate host, the rat flea, another blood-sucking ectoparasite, becomes infected as a larva. That is not likely to occur with *Melophagus ovinus*. In addition, is it not probable that, as with the rat flea, the sucking tube of the *Melophagus ovinus* is too narrow to admit the passage of the tapeworm eggs ? One may therefore conclude that it is improbable that the *Melophagus ovinus* is an intermediate host of the tapeworms of sheep.

It has been suggested that the tapeworms are transmitted to lambs *in utero* or through the milk. The same suggestion has been made with regard to *Ascaris suum*, but the investigations recently reported demonstrate that for successful artificial infection very young animals had to be used. So may it be with the tapeworms of sheep.

The other theories refer to direct infection through the contaminated food, or to an intermediate host such as dung beetles, mites or snails. No intermediate stage of the alimentary tapeworm of sheep has yet been found. Whether the life cycle is direct or not, however, the preventive measures which would be suggested would probably follow the same lines as I have laid down.

At the same time, I do not wish it to be thought that the investigation is of little importance. I hope that Mr. Daubney will follow up the excellent series of experiments which he has instituted, and will throw some light on the obscure problem, and that practitioners will, when they can, forward specimens of tapeworms of sheep for identification, so that a more comprehensive knowledge of the tapeworms of sheep, their species, and the conditions affecting their prevalence, may be obtained.

In conclusion, I desire to congratulate Mr. Daubney on the excellence of his interesting paper, and to say what pleasure it has given me to open the discussion upon it.

Major CHAMBERS mentioned an instance which occurred some years ago in which, although the fourth stomach worm was prevalent in large quantities, no tapeworm was found. An interesting point affecting treatment was that he had found out quite by accident that a combination of arsenate of soda, copper sulphate and hydrochloric acid was efficacious in dealing with the fourth stomach worm. It was a 100 per cent. remedy. He had never met

anything like it, and it would kill tapeworm at the same time. Now he used nothing else.

Mr. F. L. Gooch said their clients did not attach sufficient importance to the diseases of sheep. Flock masters, for some reason or other, were averse to calling in veterinary surgeons to attend their sheep when ailing, but when it was pointed out to the sheep breeder that for a very small sum he could secure sufficient medicine to treat all his lambs, he would be more inclined to seek professional advice. He believed there was a big field for research work in connection with diseases of sheep. To a large extent it was the veterinary surgeon's own fault that they were not called in for allowing such a large quantity of quack medicines to be used.

Mr. Martin said that, as regarded tapeworm, he did not think very much of it; the sooner the sheep got off the old turf on to the new plough land the better they did.

The Reply.

Mr. Daubney, replying, said he quite agreed with the remarks of Professor Craig and other gentlemen who took part in the discussion to the effect that, as a rule, tapeworm in lambs in this country was not usually productive of serious losses. It was only occasionally that one heard of outbreaks in which the losses were so heavy as to encourage the farmer to call in the assistance of the veterinary surgeon. That was partly due to the fact that farmers, on lands where tapeworm existed, were so familiar with the condition that they regularly practised dosing twice in every season, once before the lambs were weaned, as had been suggested, and once at the time the lambs were weaned. He knew that was so in certain parts where lambs were invariably found to be affected. With regard to the possibility of confusing the issue whether losses of lambs were due to the presence of strongyles or the presence of tapeworm, he thought they would get the two in lambs at the same time very frequently, and undoubtedly one should ascribe losses, where both parasites were present, to the round ones, which were much more likely to do much more damage than the tapeworm. In fact, they could plump for the round one every time. With regard to treatment, he was very interested to hear the recommendation of Major Chambers of arsenate of soda, copper sulphate and hydrochloric acid. That was rather similar to the powder he (Mr. Daubney) mentioned as being recommended by the South African Department. He had no doubt it was quite efficacious. As to preventive measures, he did not lay any down in his paper. The life history of the parasite was unknown, and therefore preventive measures were impossible. That fact showed the necessity for working out the life history of the parasite. He stood corrected. There were measures which, of course, must have an effect on the life of the parasite. In the first place, when they were dealing with worms, there was always to be taken into consideration the fact that numbers were necessary before the effects of worms were produced, so that anything that tended to diminish the numbers of worms without actually eradicating them altogether was doing some good. It was well to hold that view in mind. It was, at the same time, probable that the parasite would survive on the same field from year to year.

Mr. Martin: Do you mean on turf fields?

Mr. Daubney: Permanent pastures. It could not survive on plough land. They did not know what the new host, if there was a new host, was, and until they knew that—the conditions under which that new host could live—they could not say with certainty what measures should be taken against it. He knew himself that it appeared from year to year. The life history was a subject upon which they knew absolutely nothing. As Professor Craig said, they had had much speculation. In the first place, it had been suggested, owing to the early age at which large tapeworm was found in lambs, that the infection was conveyed through the dam to the lamb either in the uterus or in the milk. Some experiments he had made told that the presence of tapeworm in the ewe was not necessary to convey tapeworm to the lamb, and that lambs could contract it without contact with the ewe. That showed the survival of the parasite in some form from season to season. With regard to Major Chambers' reference to dipping and its effect on the tapeworm, was it not possible that the land on which his sheep were, though harbouring round worms, was not harbouring tapeworms, and that the intermediate host was not present? It was possible, of course, that the dipping reduced the tapeworm. Mr. Gooch had referred to the field for the veterinarian in diseases of sheep. It was a thing which had struck him very strongly, working, as he had done very considerably, amongst sheep—sheep and parasites were bound up very closely together—and he had been struck very much by the reluctance of the farmer to call in a veterinary surgeon to examine his sheep. He usually did not do that until about 30 had died. He thought it was a field which could be cultivated. In Wales two years ago they had a very bad outbreak of liver fluke, and extremely heavy losses were incurred before the condition was actually diagnosed. It was only as a result of information received from the National Farmers' Union, to the effect that sheep were dying in Wales from a mysterious disease, and notices of a similar kind appearing in the daily Press, that a representative from the Ministry was sent down to investigate the condition, which, of course, proved to be liver rot. The farmers were reluctant to accept the diagnosis, because, owing to the very small size of the flukes, they had escaped their attention on *post-mortem*, and also because they were aware of the presence in their sheep annually of a certain number of flukes, and, under the usual conditions, incurred no losses. A *post-mortem* by a veterinary surgeon would have immediately illustrated the cause of the trouble, and did so in certain districts; but one instance was recalled in which only five ewes remained in January out of a flock of 420 brought down from the hills in autumn. Had this farmer sought immediate

(*Continued at foot of next page*).

County Councils and Milk Order Inspectorships.

The following passages occur in the report presented by the Public Health and Housing Committee to the County Councils Association :—

"The Committee considered the following letter received from the Ministry of Health in reply to the objection raised by the Association to the requirement that county councils should obtain the concurrence of the Minister in cases where they propose to appoint, for the purposes of the Milk (Special Designations) Order, 1922, a veterinary surgeon who does not hold either the appointment of Local Veterinary Inspector to the Ministry of Agriculture or the appointment of Veterinary Inspector to a local authority under the Diseases of Animals Acts :—

17th April, 1923.

"Sir,—I am directed by the Minister of Health to refer to your letter of the 26th January with reference to the Milk (Special Designations) Order, 1922, and to state that he has been in communication with the Ministry of Agriculture and Fisheries in the matter, as the provisions of the Order with regard to the veterinary examination of cattle were settled after consultation with that Department. It is understood that the Veterinary Surgeons in regard to whom a comprehensive notice of concurrence was given in Circular 356 comprise about 50 per cent. of all the Veterinary Surgeons at present practising in this country, and it would appear therefore that special reference to the Department with regard to the nomination of a Veterinary Surgeon need not be very common. Where such references are received, the Ministry of Agriculture and Fisheries co-operate with this Department in making any enquiries that may be necessary.

I am to add that it is understood that the Ministry of Agriculture and Fisheries by virtue of their powers under Section 35 (3) of the Diseases of Animals Act, 1894, exercise some control over the appointments made by local authorities for the purpose of that Act, and it was thought that nominations for the purpose of the Order should be subject to similar control.

(Signed) J. N. BECKETT.

The Secretary,
County Councils Association.

"It was *resolved*—

That the Executive Council be *recommended* to reiterate their previous objection to the approval of the Minister of Health being required in any case of the appointment of a veterinary inspector for the purposes of the Milk (Special Designations) Order, 1922, and at the same time to point out, with reference to the last paragraph of the Ministry's letter, that the procedure under Section 35 (3) of the Diseases of Animals Act, 1894, to which the Committee entertain no objection, has not been followed in the present case."

(*Continued from previous page*).

expert advice and applied treatment, no doubt the major portion of his flock would have been saved. When he first went to Wales, his principal task was to convince the farmers that they were losing sheep from fluke. It struck him then that had closer co-operation existed between farmers and veterinary surgeons, they would have started very much earlier to treat these sheep and adopt prophylactic measures. Since he recommended the use of Danistol, the Department had been inundated with letters from farmers thanking the Ministry for recommending it, saying it saved their sheep. He thought they should endeavour to keep in touch with farmers on the question of sheep. With regard to specimens, that was one of the matters in which he was rather obliged to them for help than offering to help them, but he should only be too interested to determine any specimens they liked to send him of *Moniezia* and other parasites. It all helped him, in addition to furnishing them with a little information on the subject. (Applause.)

From the Wilds.

By J. MALCOLM ARMFIELD, M.R.C.V.S., Tanganyika Territory.

No lives could demonstrate a greater difference than that of a District Veterinary Surgeon in Tropical Africa and that of a practitioner in the British Isles. The former leads a wandering existence—sleeping at a different camp night after night for weeks on end, whereas the latter is bound to occupy a fixed abode throughout the year. Each has its compensations—the man in the wilds sacrifices such blessings of civilisation as the telephone, with its immediate calls to action, summonses to romantic night journeys, etc., whilst the man at home misses the charm of lonely treks, on which other white faces are not so frequent as to annoy, and where the evils attendant on too elaborate meals, and late nights occasioned by social functions, are entirely absent. In either sphere a deep interest in one's profession is naturally the essential factor in carrying one through—and next to that a capacity for enjoying amusing details.

I pass on a few of these latter, which have helped to relieve the monotony of my daily routine. We have lately been making a point of advising natives to clean out their cattle bornas. As these are mere enclosures, unroofed and unpaved, you can imagine their state at the end of the rainy season. In one case, returning after a week's interval, we found a new borna had been erected, in order to save the trouble of cleaning out the old one. On being asked if it would not have been easier to remove the offending manure, we were informed that the alternative method was the better one, as it left a plot of ground already manured for the next planting season. The fact seemed to have been lost sight of that, with a little extra labour, a large area of sufficiently-manured land could have been prepared, as against an insignificant piece of over-stimulated ground.

When, by the continual dropping of cow-dung, the floor of the cattle pen becomes raised about four feet

above the level of the floor of their dwelling huts, which surround it, the inhabitants begin to think the time has come for something to be done—especially if a travelling official happens to pass and uses a little gentle persuasion. A new set of huts and a new cattle borna are usually the result. Natives have admitted that they have seen the benefit of manuring the land, when one of their "advanced" friends has tried the experiment. But, on being asked why they do not adopt the method, they merely answered, "It is not the custom." Farmers the world over have always been considered a conservative race.

But if the inhabitants of this part neglect to make full use of solid excreta, the same cannot be said of their attitude towards urine. Cow's urine—"direct from the cow"—is used for washing out milk vessels; some of the milk from these, by the way, is destined for the white man's table. On hearing of this custom one of onr scientists replied that urine was germ free. We respect our friend's point of view, but would this knowledge appease the doubts of the average lay mind? I am informed, on good authority, that a much filthier practice is observed amongst some tribes. When a husband goes on a journey, all the urine from his wife is conserved in large vessels. On the wanderer's return—possibly at the end of several weeks—the first thing he does is to indulge in a shower bath in this stinking fluid. I myself have often come across natives giving forth a most unpleasant uriniferous odour, which would appear to verify this information.

To turn to less obnoxious, if not less senseless, habits, the following is held to be a specific against the attacks of lions. A small pumpkin is suspended over the entrance to cattle bornas; this talisman is firmly believed to possess the power of warning the sleeping attendants of a lion's approach, and they are thus able to rush out and drive off their unwelcome guest. Like Sir Roger de Coverley, referring to the accomplishments of his neighbour, Moll White, I am not inclined to put too much faith in the efficacy of these pumpkins. What innocent minds! What charming belief! Surely it is not for us to contradict such notions. Much ignorance might deservedly be tolerated in believers in such fairy tales. An incident occurred the other day which proved our friends not to be accurate followers of Lister's doctrines. We were inoculating cattle hypodermically and allowing the rather dirty method of marking the finished animals with a piece of sloppy mud. But we had to draw the line when one helper of the more intelligent order insisted on clapping his mark of cow-dung on the wound recently inflicted by the needle. But their ideas concerning rinderpest correspond with ours in one particular. They evidently agree that it is not infectious to human beings—or else why does one frequently find an animal in the last stages of this plague, sharing the small sleeping apartment with his benevolent owner?

Our natives, after all, possess many sound ideas, although they may not have any very direct leanings towards that highly sophisticated modern attitude of mind—the scientific outlook.

Natives tell me that they shelter cattle and goats in their own huts because this keeps away the tampan tick (the carrier of spirillum fever of humans). It is quite possible that the urine and fæces from these animals may act as a deterrent to the ticks. We know that cow-dung plastered on the walls and floors of huts will help to rid them of tampans, so that the native layman may be considered as the discoverer of this method.

Tuberculosis Eradication in U.S.A.

Gratifying progress has been made in the U.S.A. in the campaign for the eradication of tuberculosis. All the States are co-operating in this movement, and at the close of last year 16,216 herds had been accredited and over 100,000 additional herds had passed a first test without reactions. This widespread demonstration of the possibility of freeing individual herds from the disease has resulted in increased confidence in the area clean-up method. Already 23 States have joined in this movement.

In these States more than 150 counties had completed or were in process of testing all of their cattle, and nearly 300 more were making arrangements to begin the work. Compared with the previous year, area testing has shown more than a ten-fold increase. The adoption of the area clean-up method has not only reduced the expense and increased the efficiency of the work, but the results already obtained have done much to strengthen the belief that bovine tuberculosis can be entirely eradicated. Conclusive evidence is already at hand showing that tuberculosis in swine arises principally from infected cattle, and that its elimination from the cattle on a given premises results in its gradual reduction in the hogs.

Extensive surveys show that tuberculosis is only present in about one per cent. of the cattle in 42 per cent. of the areas of the United States, and that in a large additional area it does not exceed 3 per cent. The remaining area is much more seriously affected, but the evidence at hand indicates that this costly disease will finally yield to the scientific methods now being employed.

Cattle Branding by Electricity.

An agitation has been set on foot in Canada against the regulations under the Importation of Animals Act, 1922, which require that, after September 1st, Canadian store cattle exported to this country must be branded on the left hind-quarter with the letter C or tattooed with that letter on the left ear, unless the animal is already branded with a brand registered by the Government of a Canadian Province. Leading cattle exporters and the Canadian Society for the Prevention of Cruelty to Animals have declared that the practice is cruel, and that the branding required is not comparable with that employed in Western Canada, where the cattle are only given a "hair brand," which slightly scars the skin and prevents the growth of hair over the brand. Replying to these allegations, the Ministry states that the position with regard to branding

has been exaggerated. Most of the cattle exported from the Western States would already bear the brands usually placed upon such cattle soon after birth; but where this was not the case, the Ministry required the letter C to be tattooed inside the ear. The tattooing, declares the Ministry, is a simple operation and unlikely to cause the animal any but slight and momentary pain.

Commenting upon the report from their Ottawa correspondent that: "Cattle branding by electricity was successfully performed at Montreal, twenty steers marked with a 'C' had their hair singed, but their hides were uninjured. Representatives who were present from the Society for the Prevention of Cruelty to Animals were completely satisfied. The question now arises whether the British authorities will accept the hair brand," *The Daily News* says: "The present controversy over the question of the branding of Canadian cattle started with the report from Canada that the British authorities were proposing to enforce the regulation that all cattle must be branded before importation to this country.

"The Canadian Society for the Prevention of Cruelty to Animals immediately announced their intention of arresting the first persons found branding cattle, and applied to the R.S.P.C.A. in London for their support.

"The Ministry of Agriculture's reply to the charge of 'enforced cruelty' made by Canadian exporters was a publication of alternate regulations, in which it was pointed out that the ear-marking of cattle was permissible.

"The above message from Canada shows the anxiety of the exporters there to find some other method than branding which will satisfy the British Ministry of Agriculture.

"A *Daily News* representative who asked an official of the Ministry of Agriculture for the view of the British authorities on this question was given the following statement:

"'It is very difficult to give an answer to this query until we have seen the cattle. It depends on whether the hair is merely singed or whether the brand is so applied as to stop the growth of the hair. Unless the roots of the hair are specially treated, the hair would soon grow and cover the marks."

Slippery Roads Experimentation.

In the House of Commons on July 24th, Mr. D. Grenfell asked the Parliamentary Secretary to the Ministry of Transport what results had been shown by the experiments relating to road surfaces, particularly with regard to slippery roads and the problem of improved shoeing devices for the safety of horses; and whether he was going to issue recommendations arising from the report of those experiments?

Colonel Ashley: In October, 1921, a report was presented to the Minister of Transport on the findings of an expert committee appointed at the Minister's request by the President of the County Surveyors' Society, to consider the question of slippery roads from the point of view of horse traffic. The committee carried out exhaustive experiments with various kinds of shoeing devices and on different types of road surface. I am sending the hon. member a copy of the report, and after reading it I think he will agree that the conclusions are not sufficiently definite to warrant the issue of specific recommendations.

The Horse Whisperer.

In Cork about 110 years ago was an awkward, ignorant rustic of the lowest class. His name, James Sullivan, but better known by the appellation of the Whisperer; his occupation, horse breaking. The nickname he acquired from a vulgar notion of his being able to communicate to the animal what he wished by means of a whisper, and the singularity of the method seemed in some degree to justify the appellation. In his own neighbourhood the notoriety of the fact made it appear less remarkable, but we doubt if any instance of a similar subjugating talent is to be found on record. How his art was acquired or in what it consisted is likely to remain ever unknown, as he left the world without divulging it.

The wonder of his skill consisted in the celerity of the operation, which was performed in privacy and without any apparent means of coercion. Every description of horse or mule, whether previously broken or unhandled, whatever their peculiar vices or ill-habits might have been, submitted without show of resistance to the magical influence of his art, and in the short space of half an hour became gentle and tractable.

The effect, although instantaneously produced, was generally durable. When sent for to tame a vicious beast, for which he was paid more or less according to distance, generally two or three guineas, he directed the stable in which he and the object of the experiment were placed to be shut, with orders not to open the door until a signal was given. After a *tête-à-tête* of about half an hour, during which little or no bustle was heard, the signal was made, and, upon opening the door, the horse appeared lying down and the man by his side playing familiarly with him like a child with a puppy dog. A writer saw his skill tried on a horse which could never before be brought to stand for a smith to shoe him. The day after Sullivan's half-hour lecture this writer went, not without some incredulity, to the smith's shop, with many other curious spectators, where they were eye-witnesses of the complete success of his art.—B., in *The Live Stock Journal.*

Burns from "X-rays."

At the first hearing of evidence at a recent inquest on the body of a suicide, it was stated he had sustained a large burn on the back after an "X-ray" examination for internal pains. Medical evidence was that the man had said he was "X-rayed" several times at Victoria Hospital, and on one occasion for half an hour. The burn on his back developed into a wound 8in. by 6in. He suffered great agony. Two eminent radiologists—Dr. Berkeley and Dr. Thurstan Holland—had told a medical witness that there had been cases as bad in America, but not in England.

Mr. E. F. Pettitt, radiographer, who applied the "X-rays," said the causes of "X-ray" burns were over-exposure, too frequent application, or using too soft an "X-ray." The man was only exposed twice for a space of three or four seconds. The apparatus was without

fault, and everything was normal. He could not explain the cause of the burn in the present case. He had not seen a burn before, and he had dealt with thousands of cases.

Dr. Nuttall, honorary radiologist at the hospital, said a kind of sunburn after prolonged treatment was common. He had never seen a breaking of the skin. Mr. Pettitt was absolutely capable, careful, and reliable.

The verdict was "Suicide while of unsound mind, caused by intense agony due to the burn."—*The Times*.

In our advertisement columns attention is drawn to the course of training in meat and food inspection, arranged by the Royal Sanitary Institute, which commences on October 5th. The second part of the programme, in November, includes lectures from Lt.-Col. T. Dunlop Young, O.B.E., M.R.C.V.S., D.V.S.M., and Mr. J. R. Hayhurst, M.R.C.V.S., D.V.S.M., while the latter is responsible for a systematic practical training in inspection of meat at a cattle market. The lectures are followed by the standard examinations of the Institute, which are recognised in all parts of the British Empire.

Donkey Killed by Electric Shock.

An unusual accident is reported by an Ealing correspondent which contains a lesson for members of the public. A number of donkeys grazing on Ealing Common strayed into Gunnersbury Avenue. While they were being driven back to the common one of them bumped against an electric lamp-post and was killed by an electric shock.

A telephone message to the borough council brought electricians promptly to the spot, and the lamp-post was found to be very much "alive." The necessary steps were taken to isolate it. When the donkey fell, a man with a piece of iron rod in his hand touched the animal, one leg of which was against the post, and he, too, received a shock.

Centenary Fund Fete.

A successful garden fête and sale of work was held recently, in the grounds of Coveyheugh, Reston, Berwickshire, the residence of Major and Mrs. Baird, in aid of the Centenary Celebration Fund of the Royal (Dick) Veterinary College. The fête was opened by Mr. A. Sim, J.P., organiser of the Centenary Celebration Bazaar, which is to be held in Edinburgh on the 29th-30th November and 1st December.

A bay four-year-old, by Wood-Egon—Kingmaker, named Burdett Surprise, after having successfully won the competition at Bedford County Show, was shown at Buntingford's, where he won the open championship in a strong class, comprising the most important winners at the Royal Show at Newcastle. The latest success of this horse, who is in the charge of Mr. W. S. King, M.R.C.V.S., of Burdett Road, Bow, was to win the cup for the open classes at Westerham Hill Show.

The Veterinary Record.

22nd September, 1923.

National Veterinary Medical Association of Great Britain and Ireland, Limited.

Cheques should be made payable to the Acting General Secretary at the Offices of the Association, 12 Buckingham Palace Road, S.W.1.

N.B.—Members receiving this paper in a brightly-coloured wrapper will please understand that their subscription is already overdue, and should be forwarded at once to the above address.

THE REALISATION OF AN IDEAL.

During the last three years events, so far as they concern this Association, have been moving rapidly. The National, which we knew in the old days as a Society—the principal object of which was the holding of an Annual Meeting in different parts of the country—has developed rapidly and its character has changed. William Hunting always cherished the idea that all the local Societies might eventually link themselves with the National and that the latter, reinforced by this added strength, might become the means of uniting the profession, of becoming its mouthpiece and its representative body. His ideal has been realised. When the scheme of the affiliation of local societies was generally discussed, the societies were content to become "affiliated," and the outward and visible sign of affiliation was the payment of a capitation fee for the privilege of affiliation. A few—and only a few—of the societies still appear to adopt the attitude of individual entities and by their bearing appear to look upon the National as a distinct and *separate* organisation, which they support and to which they subscribe. The large majority have been ready and willing, not only to affiliate—but also more or less to *amalgamate* with the National and to count themselves as units of the larger body, while still keeping their individuality. They speak of themselves as "Divisions of the National," and not as local societies. That this state of homogenity should have been attained in so short a time, is a great proof of the increasing solidarity of our profession, showing that we are looking upon life with broader minds and are less affected by the "parochial" atmosphere in which so many of us spend the greater part of our lives.

Dr. Bradley evidently recognised the new conditions which have arisen and he voiced the opinion of probably all of us at York, when he proposed that the present affiliation fee should be abolished. He was

right. The affiliation fee is now an anachronism. While the affiliation fee exists, there will still remain the feeling that the local societies and the National are separate societies running on parallel lines. The abolition of the fee should be one factor in confirming not only unity of purpose, but unity of method,—the co-ordination of the organised whole.

The abolition of this fee will necessitate the alteration of our Articles of Association. This revision of the Articles will afford an excellent opportunity for widening the scope of the National and making it more capable of dealing with present and future problems affecting the Veterinary profession. The throwing open of the Association to Colonial and other Societies would have seemed almost an impossibility before the war. Now these very societies are asking for admission. The National is becoming a world-wide institution and is in a position to keep in touch with societies in other lands by means of its weekly journal. Its position is becoming increasingly responsible, and the government of its affairs and its policy needs more care and foresight than ever it has in the past. The Committee, which will consider the revision of the Articles of Association will need imagination and a broad outlook. Its task is to be no light one if it is to envisage and prepare the way for the future expansion and prosperity of the National and the Veterinary Profession throughout the Empire.

Inns of Court O.T.C. Roll of Honour.

The Inns of Court Officers' Training Corps (known as The Devil's Own) have produced a very complete Roll of Honour, containing as far as possible the names, addresses and record of every individual who joined the Corps from the commencement to the end of the late war.

The book is a large quarto volume, containing over 70 pages of history and photographs, and over 300 pages, giving names, addresses, and records of its constituent members.

A copy of this Roll of Honour has been graciously accepted by His Majesty the King, and it is thought that a very large number of the late members of the Corps would like to possess this record.

The price is 10s., and copies of the book can be obtained at the Corps headquarters, 10 Stone Buildings, Lincoln's Inn, W.C.2, or through local newsagents.

A correspondent forwards the *Evening News* photograph of "Pussyfoot Ginger—the kitten whose broken leg was operated on by three surgeons at Tottenham Hospital—having its limb dressed," and adds: "I commend the attached to your notice. It would be interesting to know whether the three surgeons worked in unison, or whether each set the leg independently for practice."

Clinical and Case Reports.

The Editor will be glad to receive from members and contributions to this column of reports of interesting cases.

Hæmorrhagic Septicæmia.

By Capt. L. G. Maguire, F.R.C.V.S., Stow-on-the-Wold.

The communications under the above heading in the *Veterinary Records* for August 11th and September 1st have been of deep interest to me, inasmuch as it is perfectly obvious that practitioners still believe this disease to be nothing more than bracken poisoning.

Being the first to report the presence of hæmorrhagic septicæmia in the British Isles, I am greatly concerned that this disease, when met with, is not recognised as such, and is, therefore, very often confused with what is, to me, the mythical disease, bracken poisoning.

For the past ten years I have been constantly coming in contact with cases of hæmorrhagic septicæmia in its various forms, viz., acute, sub-acute and chronic types, but chiefly in the acute. These cases have all proved to be due to infection with the *B. bovisepticus*, as in each outbreak this organism has been isolated, an autogenous vaccine prepared, and the in-contact animals vaccinated. In no instance have I seen the animals so treated contract the disease, and in no instance have they been removed from the surroundings where the disease appeared.

Now, turning to bracken poisoning, I may say I have never seen a case of such occurring naturally in the domesticated animals, and, furthermore, I challenge anyone conclusively to prove to me that he has seen a case of natural occurrence of this kind.

To my mind, in veterinary practice there is a great want of close association between the clinician and the laboratory. The clinician is all too ready to take things for granted, without having his surmises and *post-mortem* findings verified by the bacteriologist. Let me give a case in point. Last May I was requested by a client to come and investigate a disease which existed amongst a flock of suckling ewes. The history was that for two years previously this disease made its appearance among the suckling ewes, causing the death of as many as twenty-five out of about 200. This was the average mortality for the two years preceding May last. Having made an examination of these sheep, I found one had been dead for five hours, one just dying, and another seriously ill. I had the last one destroyed, and held *post-mortem* examinations on all three. In all three cases the lesions were all similar, and typical of hæmorrhagic septicæmia, with but one exception—the presence of pleurisy, with adhesions of parts of the lungs to the chest wall. It was these lesions which saved me from jumping to the conclusion that I had to deal with an outbreak of hæmorrhagic septicæmia. Not being satisfied, I took a swab from the heart blood of each carcase and sent them for bacteriological examination and cul-

tivation. The result of the bacteriological examination was quite a revelation. Swab No. 1—taken from carcase dead for five hours—gave a mixed infection of *B. coli* and *Diplococcus pneumonia*. Swab No. 2—taken from sheep which was on point of death—gave *D. pneumonia* in pure culture; and Swab No. 3—taken from sheep seriously ill, and which I had destroyed—gave *D. pneumonia* in pure culture. Never having heard that the *Diplococcus pneumonia* was pathogenic for the lower animals, I immediately wrote to the laboratory and queried the findings. The reply was that these findings were absolutely correct, as they were verified by biological methods and animal inoculations. Here let me enter a plea that practitioners may take greater advantage of the laboratory and work in closer unison with the bacteriologist in their efforts to unravel the mysteries of the various undiagnosed diseases met with.

I note that Major R. N. Lewis, in his article appearing in the *Record* of September 1st, mentioned that he sent specimens of bowels from carcases to the chief investigator A.D.R.A. for examination, and that this gentleman suggested that the lesions seemed typical of bracken poisoning. It would be of much interest if the chief investigator A.D.R.A would reveal the methods by which he arrived at his decision.

In an article appearing in the *Record* for November 1st, 1919, by Mr. John Brown, F.R.C.V.S., on bracken poisoning, he seems puzzled by the fact that some of the animals contracted the disease and died three weeks after being removed to pastures free from bracken.

The explanation is obvious. He was not dealing with bracken poisoning, but some acute infection which, I believe, was an acute outbreak of hæmorrhagic septicæmia; but of course it is impossible to be positive as to what the condition was without a thorough bacteriological investigation. It has been my rule for some years annually to vaccinate all the young cattle on farms where I have known hæmorrhagic septicæmia to occur, and since adopting these measures there has not been a single death from this disease.

To the sceptics who still believe that hæmorrhagic septicæmia is not present in this country I am willing to forward stained smears obtained from animals suffering and dead from this condition, showing the *B. bovisepticus* in pure culture.

I trust that this brief note may give rise to further discussion on this subject, so that some definite proofs may be obtained as to whether bracken poisoning does ever naturally exist, or whether the so-called cases are those of hæmorrhagic septicæmia, or some other undiagnosed acute infection.

Preparturient Milk Fever.

By Percy Gregory, M.R.C.V.S., Tonbridge.

Last week I was called to a cow said to have been straining for calving for seven hours. She was straining when I arrived, and was showing all symptoms of "milk fever." While watching her she fell, and was fast getting insensible. I treated her udder. Examination showed her to be quite unfit for calving. She got up in five hours, went on well, and calved on the fifth day after I treated her. I used to think that milk fever was caused by re-flow of blood after severing of the umbilical vessels. This seems to disprove that.

Variorum.

Picric Acid Stains on the skin may be removed by means of a solution containing one per cent. each of boric acid and sodium benzoate.

Colloidal Calomel (Calomelol) is a greyish-white, tasteless and odourless powder containing 75 per cent. of mercurous chloride and 25 per cent. of albumen. It is soluble in water (1 in 50) and weak saline solution, but is insoluble in alcohol. It is used in the form of an ointment or as a dusting powder with equal parts of starch and zinc oxide.

The characteristic persistent odour of Iodoform can, to some extent, be covered by oil of eucalyptus. A so-called "aromatic or deodorised" iodoform (containing two parts of coumarin to 98 parts of iodoform) is also prepared for use in ointments or dusting powders. The odour may also be disguised by dissolving the iodoform in 10 parts of Rubini's solution of camphor (camphor 4, alcohol 10). Iodopyrrole or iodol is used as a substitute for iodoform. It is odourless, non-irritant, and liberates free iodine in the tissues.

Castor Oil Seeds contain a crystalloid, ricinine and a very poisonous phytalbumose, ricin. Even so small a dose of ricin as a two and a half millionth of the body weight may cause toxic symptoms when injected. The action of ricin is, however, much less powerful in the stomach than when injected hypodermically. In the latter case small doses soon produce immunity, antiricin being formed. The observation of this protective reaction laid the foundation of serum therapeutics.

Hypodermic Medication was introduced in 1853 by Alexander Wood (1817-1884), at one time President of the Royal College of Physicians, Edinburgh. He took as his model the sting of the bee.

Powdered Cantharides can be protected from the attacks of mites if a small quantity of camphor be added. A sample of this drug was recently examined and found adulterated with finely-chopped horsehair.

Cotarnine Hydrochloride is used as a styptic, and has been recommended in all forms of uterine hæmorrhage.

Cotarnine is an oxidation product of the opium base narcotine. It has styptic properties.

Thymol Iodide is used as an iodoform substitute. It is practically odourless, but does not liberate iodine in the tissues, and this diminishes its value in surgery. It can be used as a dusting powder either

(Continued at foot of next page.)

Abstracts and Reviews.

A Test for Peristaltic Activity.

It is commonly accepted, says P. A. Fish, in the July number of the *Cornell Veterinarian*, that an important factor in the passage of material through the alimentary tract is the muscular contraction of the bowel wall. It is not unlikely that the nature ot fhe ingested material and the amount of the secretions have some influence upon its rate of passage. If the material is indigestible and distinctly foreign to the foodstuffs usually in contact with the intestinal mucosa, it is very probable that there will be some delay in its exit.

The early experiments of Réaumur and Spallanzani, in which small tubes and hollow balls were administered with the food, showed that these foreign substances passed through the body of the sheep in from 30 to 33 hours. Colin, experimenting in a similar way on the horse with small pieces of meat, glass balls and bits of marble, found that from 22 to 30 hours were required to travel the whole length of the alimentary tract.

"The compound stomach of the sheep with its complex arrangement is doubtless a factor in holding back these foreign substances as compared with the simple, single stomach of the horse and may explain the longer time noted in the case of the sheep. These earlier experiments may be subjected to the criticism that they did not truly measure the length of time to traverse the alimentary tract, because, aside from the fact that they were foreign objects, their weight and size doubtless slowed their progress and delayed their exit for some hours.

"The use of an indigestible powdered substance, although representing foreign material, is less objectionable, because if it be non-irritating and in a fine state of division it will mix freely with the intestinal contents and be carried along with them. The use of bismuth in connection with the x-ray apparatus is an example of this type of experimentation. The experiments of Cannon, Hertz, and others have brought out important and interesting facts along this line. Doubtless the amount of foreign substance used has some influence upon the rate of passage. It is reasonable to infer that the less foreign material present, the less interference will there be with the normal processes of the intestine.

"In the present experiments Sudan III was used. Its advantages are :—that it may be used in very small amounts thus interfering very little, if at all, with the normal activities. The amount used in man was 50 to 70 milligrams (¾ to 1 grain). It is soluble only in a fatty medium or in fat solvents. Taken with, or just after, a meal it is not impossible that a slight amount may be combined with the fat of the meal and absorbed to a slight extent. Otherwise it is not apparently susceptible to the alimentary secretions. The amount lost by absorption does not interfere with the test. The red colour of the dye is essential.

"Obviously the waste material already in the intestine must be discharged before the dye can appear in the excreta. The time limit for the passage of the dye will depend upon peristaltic activity, the frequency of the evacuations, the amount of secretion, and the amount of material ahead of it. In constipation the time will be lengthened ; in diarrhœa the time will be shortened.

"The test consists in giving 50 mg. or 70 mg. (¾ grain or 1 gram) of Sudan III. in a gelatin capsule, usually just before, or after, a meal. One or two grams of the fæces from the subsequent evacuations are taken, and dried. The time of the administration of the Sudan III.and of the various evacuations should be noted. After drying, the material is extracted with ether. The presence of a pink or red colour is a positive result. The other extract from the first fæces passed (before the dye had passed through) is taken as a control. Its colour is usually a greenish yellow or light brown. Later evacuations, depending on conditions, begin to show a red colour. If the tests be continued long enough a maximum red colour will be obtained which will decrease until the normal colour is again reached.

"In three experiments upon the same individual the first appearance of the dye occurred in 17 hours, 15 hours and 25½ hours respectively. The maximum colour was obtained in 17 hours, 38½ hours, and 51 hours. The return to a normal colour occurred after 52½ hours, 65¾ hours and 73 hours. In the first experiment there were 4 evacuations in the 52½ hours at intervals of 13¼, 21¼ and 14¼ hours. In the second experiment there were 6 evacuations in the 56¾ hours, at intervals of 4½, 10½, 7, 16½ and 10¾ hours. In the third experiment there were evacuations in the 73 hours, at intervals of 3, 9, 13½, 25½ and 22 hours.

"The author details other experiments, and continues :—

"Similar experiments have been tried upon the cow and goat. The minimum time for the passage of the dye was 16—17 hours for the cow, and 14—17 hours for the goat. Cuguini experimenting in a similar way upon the horse, using powdered Brazil nut as an indicator, found the minimum time ranged from 15¼ to 20 hours.

"The experiments indicate that when a meal is taken it is not passed onward as a separate entity.

(*Continued from previous page.*)

in the pure state or mixed with equal parts of talc. It is also known under the trade name Aristol.

DERRIS is the powdered root of *Deguelia* (Derris) *elliptica*. Experiments have proved that, besides being an efficient insecticide, it also possesses antipsoric properties. For the destruction of fleas on dogs and cats a powder consisting of equal parts of Derris and maize starch is recommended. Sodium fluoride, however, is more useful for the destruction of cattle lice. An active principle has recently been isolated from the root by treating it with cold ether. It occurs in the form of thin, white plates, and is toxic.

W. J. Y.

Some of it is retained and mixed with subsequent and possible former meals. The first portion to appear is usually within the range of 14 to 25 hours. The last portion of the meal may not pass out until the third or fourth day, 60—75 hours. In the herbivora a still longer period is quite frequently required.

"The uniformity in the minimum time for the rate of passage through the alimentary tract in such widely separated species of animals is remarkable, when the difference in habits, food eaten, and the length of the alimentary tract is considered.

The minimum time is tabulated as follows:—

Man—15-25 hours.
Horse—15¼-20 hours.
Cow—16-17 hours.
Goat—14-17 hours.

The ratio of body length to the length of the intestinal tract is given as follows:

Man—1 to 10 (Legs not included in body length).
Horse—1 to 12.
Cow—1 to 20.
Goat—1 to 27.

"The fact that the herbivora normally evacuate their bowels more frequently than man during the 24 hour period is a factor to be considered. The increased frequency is probably due to the greater proportion of indigestible material in the diet.

"The test is simple, easy to carry out, and the Sudan III. has apparently no irritating or injurious effect upon the bowels. It would seem to be useful in arriving at a more positive diagnosis relative to certain intestinal disorders, such as torpidity, paralysis, peritonitis, intussusception, strangulated hernia, impaction or where any obstructive cause might be suspected."—*Pierre A. Fish, in the Cornell Veterinarian.*

Effect of Big Game Elimination on *G. Morsitans.*

An experiment was carried out during four successive dry seasons and the greater part of two wet seasons over an area of about 500 square miles in Southern Rhodesia in order to determine the effect on *Glossina morsitans*, Westw., of eliminating big game in that area as far as possible. Nearly 5,000 head of game were killed during the operations, but total elimination was impossible owing to immigration from outside. As a result of the campaign, big game was approximately banished during the daytime from the haunts of the tsetse fly. The author considers that the fly diminished throughout the area during the experiment and has apparently disappeared from a considerable area formerly infested; this reduction was most marked in the more open and accessible portions of the area, the fly proving more persistent in and near broken or thick country or that which, owing to lack of permanent water, was less intensively hunted. The extension of the fly-infested area, which had been proceeding steadily for 23 years up to the commencement of the experiment, apparently ceased entirely in the area from the first year of the operations, but continued during the experiment on either side beyond the limits of the area.

The effects of the shooting operations are considered to indicate that *G. morsitans* in the area dealt with is dependent upon the larger mammals for its food supply. The net cost of the operations, though high in the aggregate, amounted only to about 4½d. per acre, and it is thought that in particularly favourable localities, where the land is of high intrinsic value, the elimination of tsetse fly by organised game hunting by paid hunters might not prove uneconomic. It must be remembered that it is difficult to eliminate game within a limited well-watered area, adjacent to heavily-stocked game country. Over the more useful type of country such an attempt would be very expensive, prolonged and difficult, and the possibility of complete elimination of the fly by this means in thick, broken, or ill-watered country is by no means established. Checking the advance of the fly is likely to prove easier than eliminating it where established, but further experience is needed in this connection. It is stated that the females of *G. morsitans* have generally been supposed not to follow a host for more than a few hundred yards, but during these operations they were observed not uncommonly to follow for as long distances as the males.

[Jack, (R. W.). Tsetse Fly. A Four Years' Experiment in Game Elimination.—*Rhodesia Dept. Agric.*, Bull. 460, 38 pp., 1 map; also in *Rhodesia Agric. Jl.*, xx., Nos. 2 and 3, pp. 207-223 and 329-348. Salisbury, April and June, 1923. *Ex. Rev. Appl. Ent.*]

Mediterranean Piroplasmosis and *Theileria Mutans.*

In support of the opinion that piroplasmosis of cattle in the Mediterranean basin is due to *Theileria mutans*, an account is given of a study of the morphology and biology of piroplasms and of attempts to immunise the French pedigree cattle intended for improving indigenous stock in the French Colonies and elsewhere.

Satisfactory results have been attained in inoculating animals against *Piroplasma bigeminum*, *P. argentinum* and anaplasmosis; but inoculation with *T. mutans* often produces fatal results, and does not confer any immunity.

The "blue bodies," supposed to be peculiar to *T. parva* and *T. annulata* (Mason) are found in the cycle of *T. mutans*; and it is certain that in South and East Africa fatal cases due to *T. mutans* have been ascribed to *T. parva*. In Transcaucasia, China, Eritrea and the Mediterranean basin cases due to *T. mutans* have been referred to *T. parva* or *T. annulata*. Coast fever due to *T. parva* exists with certainty only in South and East Africa, and perhaps in the Egyptian Sudan. *T. mutans* must now be held to cause serious and often fatal infections in animals that have suffered for a long time from chronic infection. This absence of immunity explains the possibility of experimental superinfections, and the uselessness of inoculation under present conditions of knowledge. European stock for regions where this infection co-exists with other forms of piroplasmosis and with anaplasmosis should be inoculated, prior to shipment, against these only. Their immunity from other diseases will increase

the animals' power of resisting infections with *T. mutans*, which they should contract as late as possible.

[Brumpt (E.). Les theilerioses mortelles du bassin méditerranéen sont dues à *Theileria mutans*.—*Ann. Paras. humaine and comparée*, i., No. 1, pp. 16-53, 3 figs., 2 plates. Paris, April, 1923. *Ex. Rev. Appl. Ent.*]

Cod-Liver Oil in the Winter-Feeding of Cows.

In feeding cod-liver oil to cows yielding milk, the butter fat from which was deficient in vitamin-A, it was found that the oil had no uniform effect on milk yield or fat content, the effect in all cases being much less than the result of grass feeding. The increase in vitamin-A content of milk after cod-liver oil rations was not associated with a rise in lipochrome pigments, as was the case when the animals were grass-fed. The administration of as much as 4 oz. of the oil per day resulted in no flavouring of milk or butter.—J. C. Drummond and others (*Journal Agric. Sci.*, 1923, **13**, 144, through *Journal Soc. Chem. Ind.*, July 13th, 1923, 623A), *Ex. Pharm. Jnl.*

Kent Clean Milk Competition.

The results of the first Clean Milk Competition in the County of Kent, which has been organised by the Kent Education Committee, in conjunction with the Kent Milk Recording Society, have now been announced. The competition extended over a period of three months, February 1st to May 1st, and during this period samples of milk were submitted fortnightly by each competitor to Wye College for bacteriological and chemical analysis. Surprise samples of milk were also taken from time to time at each farm by the assistant to the Agricultural Organiser, who also inspected the cow-sheds of each competitor at milking time and awarded marks according to a scale adopted by the Ministry of Health Inspectors. The awards have been made on the following scale of points:—

Examination of Milk Samples:	
Bacterial Content and Keeping Qualities ...	800
Chemical Analysis	100
Inspections on the Farm:	
Health of Cows	100
Equipment	100
Methods	400
Total maximum ...	1,500

The competition was open to any dairy herd in Kent not already producing, under licence, Certified or Grade A milk, provided that there were not less than ten cows or heifers in milk during the competition. The total number of competitors was 53, and the competition aroused considerable interest.

The results of the analyses of each sample of milk and of each visit of inspection were circularised every fortnight by the Agricultural Organiser to all the competitors, the identification of each herd being hidden under a code number, and advice was given on each occasion as to the faults that had been found and how these could be corrected. The success of the competition can best be gauged by the fact that, in the last round, no less than twenty of the competitors were producing milk of Certified Milk standard, and thirty were producing milk of Grade A standard as regards number of bacteria and bacillus coli found in their milk. There is a general desire that another competition should be held on similar lines next autumn. —*Official Gazette*, County Councils Association.

Notes and News.

The Editor will be glad to receive items of professional interest in these columns

Diary of Events.

Sept. 25th—Fellowship Examination, R.C.V.S.
Sept. 28th—Pasteur died, 1895.
N.V.M.A. Editorial Committee, 12 Buckingham Palace Road, S.W.1, at 5-15 p.m.
Oct. 1st—Veterinary Colleges re-open.
Oct. 3rd—N.V.M.A. Quarterly Meeting of Council and Committee Meetings, 10 Red Lion Square, W.C.
R.C.V.S. Quarterly Meeting.
Oct. 4th—R.C.V.S. Quarterly Meeting.
Oct. 5th—R.C.V.S. Quarterly Meeting.
N.V.M.A. Editorial Committee.
Oct. 18th—Probable date of Special Meeting of Council of R.C.V.S.
Oct. 26th—10 Red Lion Square secured for College headquarters, 1853.
Oct. 31st—Changes of address for 1924 Register to be sent to 10 Red Lion Square.

A Veterinary Surgeon was recently consulted by a rather prim lady about her cats. She asked him if he could tell the sex of a kitten from its appearance and without examining it. He admitted that this was possible and pointed out the difference in the shape and contour of the head of the two sexes. "A female," he said "has a much longer face; its ears and eyes are placed differently and the whole build of the body is different. This cat of yours here is typically a female." "Oh," said the lady, "that is the cat you doctored for me a month or so ago." Collapse of V.S. [A true story].

Major Hobday made a very pertinent remark during the discussion on Mr. Gofton's paper on the Milk and Dairies Act at York. He drew attention to the frequency with which clean milk is liable to contamination at the hands of the man who delivers milk at the door. What is the use of sending out clean milk, only obtained after elaborate precautions on the farm, when the milkman fills up used, and probably dirty, bottles in the street and seals them with cardboard discs taken from his pocket and fitted in place with fingers none too clean? Milk, as generally consumed, is still one of our dirtiest and most contaminated articles of food, in spite of its high cost and all the restrictions surrounding its production. What precautions are taken in country districts to ensure a clean milk supply?

Personal.

Marriage.—At Holy Trinity Church, Gloucester Terrace, Paddington, on September 12th, Nevill S. King, M.R.C.V.S., youngest son of Mr. Herbert King, M.R.C.V.S. and Mrs. King, of Kennington Cross, S.E.11, to Mary, youngest daughter of the late Mr. H. H. Roberts, M.R.C.V.S. and Mrs. Roberts, of Leatherhead, Surrey.